

Propagation of Native Hawaiian Wetland Plant Species

***Ten species with potential for use
in wetland restoration and
revegetation projects.***

December, 1999 (updated June, 2000)

Prepared for the United States Fish and Wildlife Service

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Background

This study was conducted with a grant from the United States Fish and Wildlife Service. The study ran from 5/98 to 11/99. A propagation facility was built at 2342 Maunalaha Road, Honolulu HI 96822. The facility included a mist house, a seed house and an initial growing area. Successfully propagated plants were then transferred for further growth and production studies to Pisces Pacifica Nursery in Kahalu'u, O'ahu.

The wetlands referred to in this report are typically low elevation wetlands and can be either marshes, swamps or stream banks. In Hawai'i, most of the native flora in these areas has been removed for either development or agriculture. There is little information on what actually constituted the flora of Hawaiian wetlands and today nearly all the vegetation seen in wetlands in Hawai'i is alien. The species chosen for this study are native plants that comprise wetland vegetation currently in Hawai'i and other Pacific islands. Some of the plants chosen for this study will do equally well in drier plantings (i.e. many stream banks).

Some species that are possible candidates for wetland restoration projects but were not studied for this project include *Cyclosorus interruptis* (neke fern), *Pycreus polystachyos* (no common name), *Torulinium odoratum* ssp. *auriculatum* (pu'uka'a, kili'o'opu, kiolohia, mau'u pu'uka'a, pūko'a, pu'uko'a) and *Bolboschoenus maritima* (kaluhā). Federally endangered plants potentially suitable for wetland restoration are *Cyperus trachysanthos* (pu'u ka'a) and *Marsilea vilosa* ('ihi lā'au). Further research needs to be conducted on the propagation and production schedules for these and other species. The list for using on dry stream banks is much larger and can be compiled from available literature.

Methods

Propagules were collected either from cultivated sources or from the wild. In no case were whole plants collected, only propagules such as stem cuttings or seeds. Proper collection protocol was followed when collections were made from the wild. That is, seeds were collected from more than one parent, sampling at least 10% of the population if available, and no more than 5% of the available propagules were collected from any population. In most cases, much fewer propagules were collected. Collections were made from species that will work as ground covers, shrubs and trees for a stratified planting.

Propagules were processed within two days from the time of collection. Seeds were cleaned from their fruit (in most cases) before sowing. Cuttings were stored in plastic bags in a refrigerator until they were processed.

The potting medium used for seeds was a commercial, peat-based mix (such as Sunshine Mix™ or Pro-mix™). No fertilizer was applied. In most cases a 4" plastic pot was used as the initial container and multiple seeds were sown in each pot (community pots). The pots were watered with an automatic irrigation system once a day for 5 minutes using shrub heads.

Cuttings were treated with varying strengths of a root inducer (Dip 'N Grow). The concentrated solution (1.0% Indole-3-butyric Acid [IAA] and 0.5% 1-Napthaleneacetic acid [NAA] active ingredients) was diluted to 1:20, 1:10 or 1:5 strengths to determine the most appropriate strength for each species. A control was also used (no Dip 'N Grow applied).

The cuttings were stuck in a #2 perlite potting medium and placed under mist. The mist was set to run 8 to 12 hours per day (depending on the season) at 15 minutes intervals for 6 seconds each.

Seedlings or rooted cuttings were transplanted to individual containers using a potting mix made of 1 part standard peat-based potting medium with 1 part black cinder. A slow release fertilizer (such as Nutricote™ or Osmocote™) was applied at this time and a bi-weekly application of foliar feed was applied with irrigation water. Final containers were either 4", 6" or 1-gallon pots.

Plants were placed in either full sun or under a 50% shade cloth. Most plants were grown on nursery benches at least 18 inches from the ground and hand watered as needed. Some plants were grown in a water pond placed on a nursery bench that had non-circulating water kept at a depth of 4 to 8 inches. Pests were controlled with application of commercial, chemical pesticides or by manual or cultural controls. Weeds were removed by hand or kept controlled with a pre-emergent (chemical barrier) herbicide.

Species results

Note: Description and habitat information was taken from "A guide to Pacific Wetland Plants" by Lani Stemmermann and published by the U.S. Army Corps of Engineers, Honolulu District, 1981, and from the "Manual of Flowering plants of Hawai'i" by Wagner, Herbst and Sohmer, published by the University of Hawai'i Press, 1990.

Bacopa monnieri



Scrophulariaceae

`Ae`ae

Water hyssop

Native Status

Indigenous

Description

Creeping herb to 5 cm high but with long stems rooting at the nodes. Leaves 1 to 2 cm long and 5 mm wide.

Habitat

From coastal marshes to wet areas exposed to brackish water. Also along fresh water streams.

Propagation

Seeds

Seeds are hard to gather but fresh seed germinate readily in two weeks and are ready for transplanting to individual pots in one month.

Cuttings

Cuttings are easily propagated. Segments of the stem can be laid on moist potting mix directly in the final pot size. Kept moist, the segments will root in 1 to 2 weeks and the pot will be ready for use in 6 to 8 weeks. The easiest method is to gather handfuls of the stems and cut them into one inch lengths allowing the cuttings to fall on the prepared pots.

Notes

Plants do equally well in full sun or part shade. Long periods of drought will kill the plants. For full pots the plants should be trimmed once or twice to encourage branching.



***Cyperus javanicus* (syn.: *Mariscus javanicus*)**



Cyperaceae

‘Ahu‘awa, ‘ehu‘awa

Marsh cyperus

Native Status

Indigenous

Description

Perennial sedge with slightly 3-angled stems 40 to 100 cm tall.

Habitat

Often found in coastal marshes exposed to salt or brackish water or coastal strand interface and an occasional weed in lowland taro patches. In Hawai‘i common in marshes, taro paddies, along streams and ditches, coastal pastures. Rocky coastal sites and cliffs, 0-180 M and on all the main islands except Kaho‘olawe.

Propagation

Seeds

Mature fruiting bodies are broken up and placed directly on potting medium or seeds are cleaned from fruits and placed on potting medium. Seeds germinate in less than two weeks if they are viable. Transplant to individual containers when the seedlings are one to two inches tall. Seedlings can be transplanted individually or in small clumps.

Division

Mature plants can be divided into parts with five or more leaves per segment (clump). Each clump should be placed in its final container size.

Notes

Plants grow quickly until they are either pot bound or mature. They can be grown dry or wet. The plants are quite drought tolerant and also tolerate standing water up to 8 inches deep. Six-inch pots or larger are best for producing mature plants. These plants do equally well in shade or full sun.

Cyperus laevigatus



Cyperaceae

Makaloa, makoloa `ehu `awa

Native Status

Indigenous

Description

Perennial creeping sedge with roundish stems 10 to 70 cm tall and 2 to 3 mm in diameter.

Habitat

In Hawai‘i occurring on mud flats, sandy coastal sites and on edges of and in fresh, brackish, and saltwater ponds, 0-10 m on Laysan, Ni‘ihau, O‘ahu, Moloka‘i, Maui and Hawai‘i.

Propagation

Division

Plants can be divided into clumps with as little as three leaves per clump. The clumps must have the underground stem attached and clumps with 10 to 15 stems is best for consistent production. Newly divided plants start growing new stems in one to two months and plants in one-gallon pots can be further divided every three to six months.

Notes

The test plants were grown in standing water or on benches. They produce new stems and are ready for dividing faster when grown in standing water or kept very wet. They are best when grown in 1-gallon pots. These plants do equally well in a shade house or full sun.

Fimbristylis cymosa



Cyperaceae
Mau'u `aki`aki

Native status

Indigenous

Description

Perennial sedge with erect, 3-angled stems 10 to 50 cm tall.

Habitat

A coastal and wetland species from coastal marshes and ruderal habitats.

Propagation

Seeds

Cleaned seeds or broken up seed heads are planted on the surface of the potting medium. Viable seeds germinate in 1 to 3 weeks and are ready for transplanting in 1 to 2 months. They can be transplanted as individual plants or small clumps of seedlings.

Divisions

Larger clumps can be further divided by breaking the plants into clumps that contain at least 5 leaves and a portion of the compressed stem. Propagation by division is not as easy or quick as by seeds.

Notes

The plants are drought tolerant and in this study were grown on nursery benches. Plants survived equally well when kept constantly moist or allowed to dry between waterings. Attempts were not made to grow these plants in standing water. Pot sizes of 6" or larger were best. The plants did best in full sun.

Hibiscus furcellatus



Malvaceae

‘Akiahala, ‘akiohala, hau hele,
hau hele wai

Native Status

Indigenous

Description

Perennial herbs or subshrubs 1 to 2.5 m tall.
Irritating hairs on the younger branches and fruits.
Showy purple flowers.

Habitat

Marshy or low places near sea level. In Hawai‘i occurring primarily in wet, disturbed areas, 90-240 m on Kaua‘i, O‘ahu, Maui and Hawai‘i though it may have once been common in nearly all valleys and sheltered places on both windward and leeward sides of the islands.

Propagation

Seeds

Fresh or stored seeds germinate readily in 3 to 4 weeks. Seedlings are ready for transplanting 2 to 4 weeks from germination.

Cuttings

Greenwood or semi hardwood root easily without the use of hormones. If Dip ‘N Grow is used it should be applied at a dilution of 1:20. Roots form in 2 to 3 weeks and cuttings are ready for transplanting in 1 month.

Notes

Plants do best in 1-gallon size or larger pots. They grow equally well in partial shade or full sun. Pinching out of growing points will encourage multi-branched, sturdier shrubs.

Hibiscus tiliaceus



Malvaceae

Hau

Native status

Indigenous? Polynesian introduction?

Description

Small tree or large shrub to 15 m tall. Leaves are heart-shaped and 10 to 20 cm wide. Flowers are yellow with a maroon center, turning to orangish color late in the day.

Habitat

This hibiscus grows in dense thickets in the lowlands where it can be found along streams, at mangrove margins, in lowland swampy areas and on slopes as well.

Propagation

Seeds

Fresh, mature seeds germinate in 3 to 4 weeks. Seedlings grow quickly.

Cuttings

Semi-hardwood or hardwood cuttings (4 to 8 inches long) are best. Greenwood cuttings are inconsistent rooters and tend to rot. Roots form in 3 to 6 weeks when using Dip 'N Grow at 1:10. Cuttings should be transplanted when roots are 3 to 4 inches long.

Notes

Large branches can be rooted by sticking them directly in the ground where they are needed. Leaves and small branches should be removed and the branches placed close together to allow for some death. One-gallon pots or larger are needed for proper production.

Ipomoea pes-caprae



Convolvulaceae

Pōhuehue

Beach morning glory

Native status

Indigenous

Description

Long-trailing vines, non-twining with large roundish leaves and showy pinkish-purple to white flowers.

Habitat

This plant is usually restricted to the coastal strand but often found in lowland marshes as well.

Propagation

Seeds

Mature seeds germinate in as little as two weeks to as long as 4 months.

Cuttings

Cuttings root at the nodes and at least one node should be included with each cuttings. No rooting hormone is needed and roots form in 2 to 3 weeks. Two- or three-node cuttings are best.

Notes

Plants grow best in full sun. Pot sizes or 6" or more are needed for adequate growth. Frequent pruning is needed to keep the plants in a confined area on the bench.

Sesuvium portulacastrum



Aizoaceae

ʻĀkulikuli

Sea purslane

Native status

Indigenous

Description

Succulent herbs with red to green stems and thick leaves.

Habitat

In Hawaiʻi occurring in a variety of coastal habits including the edges of fresh, brackish and saltwater ponds.

Propagation

Cuttings

Stem segments with two or more nodes are used. No rooting hormone is needed and roots form nodally and internodally in 2 to 4 weeks. The rooted cuttings are ready for transplant when the roots reach 2 to 3 inches long.

Notes

Four-inch pots are adequate but best growth occurs in 6 inch pots or larger. Plants do best in full sun.

Sporobolus virginicus



Poaceae

‘Aki‘aki, ‘aki, mahiki, māhikihihi,
mānienie, mānienie ‘aki‘aki,
mānienie māhikihihi, mānienie
maoli

Beach dropseed, saltgrass,
seashore rushgrass

Native Status

Indigenous

Description

Perennial grass with buried rhizomes and erect branches to 30 cm tall. Leaves are narrow, bluish and often rolled blade two to 10 cm long.

Habitat

Found in coastal marshes and other coastal habitats, usually rooted in the sand. Can be seen along stream beds in lowlands.

Propagation

Divisions

Established plants can be divided as long as each clump has a rooted underground stem (rhizome) attached.

Cuttings

Stem segments (either apical or medial sections) were successfully rooted under mist using Dip ‘N Grow at a dilution of 1:20. Roots form in 2 to 4 weeks and rooted cuttings can be planted in potting medium once roots are approximately 2 to 3 inches long.

Notes

The plants in this study were grown in 4 inch pots on benches. They survived equally well when kept constantly moist or allowed to dry out between watering. The plants also grew equally well in partial shade or in full sun. Those in partial shade provided the most productive cuttings.

Thespesia populnea



Malvaceae

Milo

Native Status

Indigenous? Polynesian introduction?

Description

Small trees 5 to 20 m tall with shiny, heart-shaped leaves 8 to 20 cm wide. Yellow flowers fade to pinkish as the day progresses.

Habitat

Found in the coastal strand, and sometimes along rivers at the interface of the mangrove-coastal strand interface and exposed tidal influence.

Propagation

Seeds

Fresh, viable seeds germinate in 4 weeks to 3 months. Seedlings are ready for transplanting one to two weeks after germination.

Notes

Dibble tubes (for small plants) or 1-gallon pots or larger (for larger plants) are best for production. Plants do equally well in full sun or partial shade.

Production Schedule Table

Note: The numbers in this table are number of weeks.

Species	4" pots	6" or 1 gallon pots	Delivery
<i>Bacopa monnieri</i> seeds	4	10	12-20
<i>Bacopa monnieri</i> cuttings	2	2	4-8
<i>Cyperus javanicus</i> seeds	4	16	24
<i>Cyperus javanicus</i> divisions	1	4	10
<i>Cyperus laevigatus</i> divisions	4	8	12
<i>Fimbristylis cymosa</i> seeds	6	10	8-16
<i>Fimbristylis cymosa</i> divisions	4	10	6-10
<i>Hibiscus furcellatus</i> seeds	4	10	12-16
<i>Hibiscus furcellatus</i> cuttings	4	10	10-14
<i>Hibiscus tiliaceus</i> seeds	5	10	16-20
<i>Hibiscus tiliaceus</i> cuttings	6	8	12-16
<i>Ipomoea pes-caprae</i> seeds	8	12	16-20
<i>Ipomoea pes-caprae</i> cuttings	4	8	12-16
<i>Sesuvium portulacastrum</i> cuttings	4	8	10-12
<i>Sporobolus virginicus</i> cuttings	6	12	16-20
<i>Sporobolus virginicus</i> divisions	4	8	10-12
<i>Thespesia populnea</i> seeds	8	16	20-24

This table is a guide to help plan time tables for both the purchaser of the plants and the growers. The number of weeks is an estimation and assumes an adequate number of propagules is available from which to propagate. Not all nurseries have access to propagules and stocks may need to be built up to meet project needs. Some nurseries may have stock in hand of some of these species and none of others.

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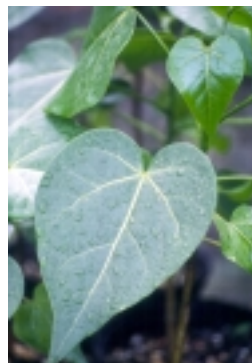
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